eNOTICE-2
EU Network of Training Centres for preparedness to CBRN Events

Classification of assistive devices

Scope of this document

In the realm of CBRN emergency response, the **decontamination of individuals** is a critical process, especially in scenarios involving hazardous materials or biological threats. For **people with disabilities**, this procedure presents unique challenges that require specialized **assistive and supportive devices** to ensure their safety and well-being. The UCPM KAPP project eNOTICE-2 addresses these challenges by equipping first responders, including firefighters, civil protection and emergency health responders, with the necessary tools and knowledge to effectively decontaminate individuals with disabilities and assistive devices. This document presents **the classification of available assistive devices**.

Available assistive devices

The term "disability", as used in eNOTICE-2 project, refers to a condition or function that significantly impairs a person's physical, mental, or sensory abilities and necessitates the use of an assistive device. In the following sections will describe the main assistive devices that the project addresses.

According to the European Council[1], in 2022 27% of the EU population over the age of 16 had some form of disability. This is comparable to research in the UK[2], which estimates that 23% of adults of working age have a disability, rising to 45% in those over 65 years of age. According to Eurostat estimates, that equals to 101 million people, or one in four adults in the EU, and approximately 16 million people in the UK[3]. The percentage of people with a disability per country in the EU shows the countries that had the highest share of people with disabilities in 2022 were: Latvia: 38.5%, Denmark: 36.1%, Portugal: 34%. For the EU Member States of eNOTICE-2 consortium the figures are the following – Belgium: 25.6%, Czech Republic: 26.6%, Germany: 30.3%, Italy: 22.7%. The UK estimate is 24%.

The older the person gets, the more likely he/she is to have a disability. The share of people with disabilities by age group in 2022 is the following:

- From 16 to 19 years: 8%
- From 20 to 24 years: 9.5%

[1] https://www.consilium.europa.eu/en/infographics/disability-eu-facts-figures/#:~:text=How%20many%20people%20have%20a,people%20adults%20in%20the%20EU [28.06.2024]

2 Commons Library Research Briefing 09602, UK disability statistics: Prevalence and life experiences, House of Commons Library, 23 August 2023.

[3] *Ibid*.

- From 25 to 34 years: 11.3%
- From 35 to 44 years: 14.7%
- From 45 to 64 years: 26.9%
- 65 years or over: 52.2% (45% in the UK).

The population ageing largely influences the trends associated with people being registered as disabled. An increase in the proportion of older groups in the population tends to lead to an increase in primary disability. In addition to medical and biological factors, the negative socio-economic conditions contribute to the growth of disability, where disability is also linked to poverty and social exclusion: according to the WHO[4], disability primarily affects vulnerable groups: women – in average around 9% more women than men experiencing some form of disability, the elderly, the poor. As economic activities are paramount across the EU member states, it is also important to note that specific categories of workers are more exposed to accidents and health risks – and therefore face a higher likelihood of disabilities and the need for assistive devices - than the general population, often due to the nature of their work, the environments they operate in, or the tasks they perform. Examples include workers in the construction, healthcare, agriculture, manufacturing, transportation of goods, and even first responders themselves.

Among these individuals with some form of disability, a significant proportion require assistive devices to manage daily activities and emergencies. In fact, data from the Academic Network of European Disability experts indicates that nearly 60% of people with disabilities in Europe rely on at least one type of assistive device, ranging from mobility aids to communication tools.[5]

While the primary focus of decontamination (especially mass decontamination) is to save lives by processing as many people as quickly as possible, decontaminating assistive devices remains a significant challenge for emergency responders. This process requires additional expertise, human resources, and specialised equipment. It is also likely that a specific tracking procedure will need to be developed to ensure that the correct devices are reunited with their owners after decontamination. This is particularly challenging for small items, such as eyeglasses or hearing aids.

The necessity for specialized assistive devices becomes even more pronounced in emergency situations. Based on figures provided above (European Council[1]: 27% of the EU population over the age of 16) may have some form of disability, we can assume that in the event of a CBRN crisis, emergency responders could encounter 2 to 3 individuals with assistive devices that require decontamination.

Standard decontamination procedures often fail to account for the diverse needs of individuals with disabilities, potentially compromising their safety and the effectiveness of the response.

[4] https://www.who.int/news-room/fact-sheets/detail/disability-and-health [28.06.2024]

[5] Grammenos, S. (2020): European comparative data on Europe 2020 & People with Disabilities, Centre for European Social and Economic Policy (CESEP ASBL), Academic Network of European Disability Experts (ANED)

Therefore, the development and implementation of specifically adapted decontamination procedures are paramount.

In this chapter, we will explore the various supportive devices used by people with disabilities. We will examine their design, functionality, and integration into emergency protocols. Additionally, we will discuss the ongoing efforts and innovations within the "eNOTICE-2" project, highlighting the advancements made to support firefighters and civil protection in their critical role of ensuring the safety of all individuals during decontamination procedures.

By focusing on the intersection of disabilities and emergency response, this chapter emphasises the importance of inclusive safety measures and the necessity of the decontamination of supportive devices of all citizens, ensuring no one is left behind in times of crisis.

Wheelchairs

The prevalence of severe walking disabilities increases significantly with age, leading to a higher demand for wheelchairs among older adults. Statistical data indicates that 30.9% of all people with severe disabilities in Europe are over the age of 75, while just approximately 4% are under the age of 25. A substantial 45% belong to the age group of 55-75 years. In Germany, it is estimated that there are approximately 1.6 million wheelchair users, while in the UK there were at least 586,000 wheelchair users registered in a survey in 2021/22[6], highlighting the critical need for effective decontamination procedures tailored to this population.[7]

In Italy, out of a sample of 11.8 million people aged age 15 and older with limitations in activities of daily living, 24,13% and 23,95% report having difficulty, respectively, in walking on a flat surface for 500 meters and to walk up or down a flight of stairs without the help of a person and the use of aids, such as canes and wheelchairs. Those aids, however, are not differentiated[8]. Therefore, the value shall be considered as reference also for the following paragraph referred to “Walking Aids” in general.

Wheelchairs come in various forms, each designed to meet specific needs and preferences (all prices are estimated due to current (2024) market research on several providers):

- Standard Wheelchair (€100): A basic, manual wheelchair suited for general use.
- Standing Wheelchair (ca. €800): Allows users to raise themselves to a standing position.
- All-Terrain Wheelchair (ca. €500): Designed for rough or uneven surfaces, providing greater mobility outdoors.
- Adaptive Wheelchair (ca. €250): Customized to fit the individual needs of the user.
- Electric Wheelchair (ca. €400): Powered by batteries, offering enhanced mobility without manual effort.

6 wheelchair-economic-study-final.pdf (motabilityfoundation.org.uk)

[7] Rehdat (2015): Nur den Tag absitzen? Nichts für mich? Wie sich die berufliche Teilhabe von Rollstuhlnutzenden gestalten lässt. (=REHADAT-Wissen, Ausgabe 04). Köln. Online available: https://www.rehadat-wissen.de/ausgaben/04-rollstuhlnutzende/ [21.06.2024].

[8] Rapporto Osservatorio Salute 2022, p.257 and following, https://osservatoriosullasalute.it/wp-content/uploads/2023/06/ro-2022-disabilita.pdf (Accessed July 2024)

- Commode Wheelchair (ca. €90): Incorporates a built-in toilet seat for convenience.
- Sports Wheelchair (ca. €350): Designed for athletic activities, featuring lightweight and durable construction.
- Multifunctional Wheelchair (ca. €450): Equipped with various features for versatility in use.
- Lightweight Wheelchair (ca. €200): Easier to manoeuvre and transport due to reduced weight.[9]

There are many challenges associated with a wheelchair DECON. As previously stated, this requires expertise, human resources, and specialised equipment, particularly to carry out the "dismantling-cleaning-reassembling" DECON cycle. Given the widespread use of water for decontamination, conventional cleaning cannot be directly applied to an electric wheelchair. Therefore, decontaminating an electric wheelchair requires careful attention to its various components to ensure thorough cleaning without causing any damage. The key parts to be decontaminated include:

- Frame: Made of aluminium, steel or titanium, the frame is the main structural component.
- Handles: Typically constructed from plastic, these are crucial for manoeuvring the wheelchair.
- Seat Cushion: Often made from foam, gel or air-filled materials, providing comfort and support.
- Covers: Usually crafted from nylon or polyester, these materials cover the seat and backrest.
- Wheels: Composed of rubber and/or polyurethane, they enable the wheelchair's mobility.

Electric wheelchairs, in particular, require specific care instructions during the decontamination process:

- Control Unit: Ensure that the control unit is switched off during cleaning to prevent accidental movement or activation of electric functions.
- Joystick Steering: Avoid touching the joystick steering during cleaning to prevent the wheelchair from starting to move.
- Batteries: Batteries contain acids that can pose health risks. Handle with caution to avoid leaks or spills.
- Cleaning Agents: Do not use organic solvents such as thinner, white spirit or turpentine, as these can damage the wheelchair. Also, avoid abrasive or harsh cleaning agents to prevent scratches.
- Cleaning Methods: Do not use high-pressure or steam cleaners as these can damage the electronic components and the overall structure of the wheelchair.

[9] all prices are estimated due to current (2024) market research on several providers

By adhering to these guidelines, emergency responders can effectively decontaminate wheelchairs, ensuring the safety and well-being of individuals with disabilities during emergency situations[10]. This approach not only enhances the effectiveness of the decontamination process, but also upholds the dignity and independence of wheelchair users.

Walking aids

In Europe, the need for walking aids is a significant concern, particularly among the elderly and those recovering from injuries. While comprehensive statistics on walking aid usage in Germany are lacking, data from Austria provides insight into the broader European context. A survey conducted in Austria in 2019 revealed that 2.3 % of respondents experienced great difficulty walking without the assistance of a walking aid. This statistic underscores the importance of accessible and effective walking aids to support mobility and independence[11].

The demand for walking aids is evident in the sales figures reported by manufacturers. For instance, in Germany over 550,000 rollators are sold on a yearly basis, highlighting the widespread reliance on these devices[12]. Walking aids encompass a range of devices beyond wheelchairs, each tailored to specific needs and mobility challenges.

- Walking sticks are one of the most common types of walking aids, for example, a UK survey in 2013 found that around 20% of the UK population used walking sticks to aid their mobility[13]. They help individuals maintain balance and make walking easier, particularly for those with joint problems. Walking sticks are crafted from various materials including wood, aluminium, carbon fiber, fiberglass, rubber, plastic and leather. Their simple yet effective design makes them a popular choice for enhancing stability and reducing the strain on joints.

- Crutches are primarily used after injuries or surgeries to support the recovery process. These aids help redistribute weight away from the injured limb, allowing for safer and more comfortable movement. Crutches are typically made from materials such as carbon, carbon fiber, aluminium, plastic, steel and rubber. Their design ensures durability and adjustability to cater to different heights and weights. The 2013 UK survey referred to previously, found that around 1% of the UK population used elbow crutches to aid mobility.

- For individuals requiring more stability, a walking frame is often the preferred solution, for example, claimed to be used by around 6% of the UK population in the 2013 survey. Walking frames provide a stable support structure, making them especially useful for elderly people or those with significant mobility issues. They are constructed from

[10] Wie reinige ich meinen Elektrorollstuhl? | MC Seniorenprodukte (mc-seniorenprodukte.de) https://www.mc-seniorenprodukte.de/elektrorollstuehle-rollstuehle-elektrisch/ratgeber/wie-reinige-ich-meinen-elektrorollstuhl [21.06.2024].

[11] Bundesministerium Soziales, Gesundheit, Pflege und Konsumentenschutz (2019): 34ff. Österreichische Gesundheitsbefragung 2019 (statistik.at)

[12] Ärzte Zeitung (2017): Rollator der Zukunft; available: aerztezeituhttps://www.aerztezeitung.de/Politik/Rollator-der-Zukunft-305323.htmlng.de, [21.06.2024]

13 Use of mobility aids by gender in England 2013 | Statista

materials like aluminium, steel, plastic and wood. The frame's design offers support, reducing the risk of falls and promoting confidence in movement.

Rollators represent another advanced type of walking aid, combining stability with additional features for convenience. These devices include a seating area and storage space, making them ideal for longer walks and shopping trips. Rollators are manufactured from materials such as aluminium, steel, plastic and rubber, ensuring both robustness and ease of use. The inclusion of wheels enhances mobility, allowing users to navigate their environment with greater ease.

Each type of walking aid serves a specific purpose, from providing basic balance support to offering comprehensive stability and additional functionalities. Understanding the diverse range of materials used in their construction (from lightweight aluminium and carbon fiber to durable steel and rubber) highlights the engineering behind these essential devices.

In conclusion, walking aids play a crucial role in enhancing the mobility and quality of life for many individuals across Europe. Whether through the use of walking sticks, crutches, walking frames or rollators, these devices help maintain independence and safety for those with mobility challenges. To be able to maintain the independence of contaminated citizens, emergency responders have to ensure a fast return or the provision of a substitutional aid as fast as possible.

Canes for the blind

The importance of decontaminating assistive devices for people with disabilities cannot be overstated, as these devices are crucial for maintaining their independence and safety. Among the various aids used by individuals with disabilities, canes for the blind and guide dogs play a pivotal role for those with visual impairments.

In Germany, statistics from 2019 highlight the significant number of individuals affected by visual impairments. There were 71,544 blind people, 46,858 people with a high degree of visual disability and 230,507 individuals with a minor visual disability.

In Italy ISTAT Data updated to 2023 report 108,416 people with blindness and partial blindness. Severe visual impairments affect 1.9% of the population from age 15 and up, with the percentage rising to 5% to those over 65 years old and 8% over 75 years old[14]

Canes for the blind are indispensable tools for navigation and safety. There are four main types of canes, each serving a specific purpose:

- The long cane for the blind is the most common type, used primarily for detecting obstacles in the environment. It extends from the ground to the user's chest or head and helps in navigating spaces by tapping or sweeping the ground ahead.

- The touch stick is designed for individuals who need minimal assistance. It provides a basic level of support and guidance, helping to detect obstacles at ground level.

[14] Italian Ministry of Health, "La disabilità visiva in Italia", https://www.salute.gov.it/portale/prevenzioneIpovisioneCecita/dettaglioContenutiPrevenzioneIpovisioneCecita.jsp?lingua=italiano&id=2389&area=prevenzioneIpovisione&menu=vuoto (Accessed July 2024).

- The signal stick serves as an identifier for people with visual impairments, alerting others to their condition. It is usually shorter and used to signal that the person may need assistance.

- The white cane is used by individuals who have both visual and walking impairments. It offers stabilization and support while also serving as a signal to others that the user has a visual disability. The materials used in the construction of these canes are chosen for their durability and light weight. The stick itself can be made from aluminium, plastic, wood, fiberglass and nylon. Handles are typically crafted from leather, rubber, plastic or wood, providing a comfortable and secure grip.

- In addition to canes, guide dogs are an invaluable resource for blind and visually impaired individuals. These specially trained animals offer mobility assistance, independence, and companionship. The process of training a guide dog involves rigorous and specialized training to ensure that the dog can safely navigate obstacles and respond to various environmental cues.

Decontaminating canes and guide dog harnesses is a critical aspect of maintaining the health and independence of visually impaired individuals. Canes, frequently in contact with various surfaces, can harbour contaminants that pose health risks. Proper cleaning of the cane involves using non-abrasive, non-toxic cleaning agents to avoid damaging the materials. Similarly, harnesses used by guide dogs need to be cleaned to prevent the build-up of dirt and bacteria, ensuring the comfort and safety of both the dog and its owner.

Overall, the effective decontamination of these supportive devices is essential in preserving their functionality and extending their lifespan. For the individuals who rely on them, these devices are more than just tools; they are lifelines that enable them to navigate the world with confidence and independence. By prioritizing the cleanliness and maintenance of canes and guide dog harnesses, we can help safeguard the health and autonomy of those with visual impairments, ensuring they can continue to live full and independent lives. One should not forget that the guide dog itself needs to be decontaminated. Especially breeds with longer hair are to be decontaminated right away to avoid the unwanted spreading of the contamination.

Prosthetics

In Germany, a significant number of individuals rely on prosthetics to regain mobility and independence. In 2014 alone, there were 57,637 amputations recorded, with 48,561 of these being diabetes related. These amputations were categorized into 13,031 major amputations—those involving the lower extremity between the ankle and the body torso—and 35,530 minor amputations, which occur below the ankle. A gender breakdown of these statistics reveals that 25,855 minor amputations and 8,366 major amputations were performed on males, compared to 9,675 minor and 4,655 major amputations on females.[15]

Research published in 2023 in the UK found that 45,000 people rely on prosthetic limbs in the UK, with more than 5,000 people each year having new lower-limb amputations.

[15] Kröger, K. et al (2017): Amputationen der unteren Extremität in Deutschland - Eine Analyse auf der Grundlage von Daten des Statistischen Bundesamtes im Zeitraum 2005 bis 2014, *Lower limb amputation in Germany — an analysis of data from the German Federal Statistical Office between 2005 and 2014*, Dtsch Arztebl Int 2017; 114: 130-6; DOI: 10.3238/arztebl.2017.0130

In Italy, available ISS data on amputations are updated to 2009. One of the major causes for amputation are complications related to diabetes. In that regard, more minor amputations are performed in the diabetic population than in the non-diabetic population while the frequency of major amputations is similar in the two populations. However, it should be noted that people with diabetes make up only 5 percent of the total population, so major amputation rates are more than 20 times higher than in the non-diabetic population. In 2009, amputations for diabetic patients were 9.3% per 100,000 residents on minor amputations and 3.8% on major amputations. For non-diabetic patients in 2009 minor amputations were 3.9% while major amputations were 3.8%. Amputations are twice as frequent in man compared to woman, and are strongly related to age, with values close to 0 under 40 and subsequently increasing as high as 50 per 100,000 residents in the population over age 70[16]. A 2022 report of the Italian Registry for Arthroprosthesis reported in year 2021 a total of 117.304 hip replacements, 81.992 knee replacements, 11.366 for shoulder replacements and 1,500 other types of replacements, with a median annual increment of 3.6% (based on data from 2001 to 2021)[17]. Prosthetics attach to a variety of body parts, including the face (nose and ear prosthetics), upper body (shoulder and chest prosthetics), arms (forearm, upper arm, full arm and elbow prosthetics), hands (partial hand, full hand, partial finger and full finger prosthetics), legs (below-knee, above-knee, whole leg and knee prosthetics) and feet (partial and full foot prosthetics). The decontamination of these devices is critical, especially for those that are partially or completely inside the body, such as nose, ear, shoulder, chest, and knee prosthetics, which require specialized treatment during the decontamination process to prevent infections and other health complications.

Given the high incidence of lower extremity amputations, leg prosthetics are particularly common. These prosthetics are designed with several components, including the liner, the socket, the adapter between socket and knee fitting part, the knee fitting part, the adapter between knee and foot fitting part and the foot fitting part. Materials used in the construction of leg prosthetics include silicone, various foams and padding materials, polyethylene, carbon fiber, titanium and aluminium. These materials are selected for their durability, light weight and ability to withstand daily use. The decontamination of these various materials has to be determined and exercised while focusing on maintaining the prosthetics' complete functionality.

The costs associated with prosthetics can vary widely, reflecting the complexity and customization required. Arm prosthetics can range from €5,000 to €60,000,[18] hand and finger prosthetics from €1,600 to €60,000[19] and leg prosthetics from €150 to €20,000[20]. It is important

[16] Ospedalizzazione per amputazione dell'arto inferiore. Istituto Superiore di Sanità (https://www.epicentro.iss.it/igea/diabete/Amputazioni)
Registro Italiano ArtroProtesi, Report Annuale 2022 - Dati 2007-2021 https://riap.iss.it/riap/it/attivita/report/2023/11/07/report-annuale-riap-2022/ (Accessed August 2024).

[17] Registro Italiano ArtroProtesi, Report Annuale 2022 - Dati 2007-2021 https://riap.iss.it/riap/it/attivita/report/2023/11/07/report-annuale-riap-2022/ (Accessed August 2024).

[18] Armprothesen und Handprothesen (streifeneder.de) https://streifeneder.de/sanitaetshaus/produkte/prothesen/armprothesen/ [21.06.2024]

[19] Kein Anspruch nach Finger-Teilamputation | L 8 KR 171/07 (soziahttps://sozialversicherung-kompetent.de/krankenversicherung/leistungsrecht/281-finger-teilprothese-kein-anspruch-nach-finger-teilamputation.html#:~:text=Die%20Kosten%20f%C3%BCr%20die%20Finger [21.06.2024]

[20] Prothesen: Beine für die Dritte Welt - Medizin - Gesellshttps://www.planet-wissen.de/gesellschaft/medizin/prothesen/pwiebeinefuerdiedrittewelt100.htmlchaft - Planet Wissen (planet-wissen.de) [21.06.2024]

to note that these prices are estimates and the actual cost of a prosthetic device can differ significantly depending on individual needs and specifications. In Germany, health insurance typically covers most of these costs, ensuring that necessary prosthetics are accessible to those who need them. However, due to high costs of manufacturing and the effort put into the fitment of prosthetics, the need for replacement due to damages by the decontamination process must be avoided at all costs.

Modern prosthetics often incorporate advanced technologies such as motion sensors and myoelectric systems. Motion sensors in leg prosthetics, for example, detect load and enable a natural walking pattern, with small connectors that are sometimes visible[21]. Myoelectric prosthetics, which use electrodes to detect muscle movements, allow for more precise control and functionality. These prosthetics are generally designed to be concealed under clothing and can be detachable or removable for ease of cleaning and maintenance.

The decontamination of prosthetic devices is essential for maintaining their functionality and preventing infections. External parts should be cleaned with gentle agents that do not damage the materials, while internal components, particularly those in contact with the body, require careful handling. Regular maintenance and proper hygiene practices are crucial for extending the lifespan of prosthetics and ensuring the health of the user.

In conclusion, the decontamination of prosthetics is a vital aspect of care for individuals with disabilities. These devices significantly enhance the quality of life by providing essential support and mobility. Ensuring their cleanliness and proper functioning is crucial for maintaining the health and independence of those who rely on them, highlighting the importance of rigorous yet suitable decontamination protocols in emergency response.

Hearing aids

For people with hearing impairment, hearing aids are essential devices that enhance ability to communicate and interact with their environment, thereby improving their overall quality of life.

In Germany, there are 15.7 million individuals over the age of 14 who experience significant hearing disabilities, according to statistics from 1999[22].

In the UK, it is estimated that 1 in 6 of the adult population is affected by hearing loss, the majority being aged 60 and over, with around 2 million people using hearing aids[23].

In Italy, according to a 2022 research commissioned by the European Hearing Instrument Manufacturers Association (EHIMA) only 4.4% of the population uses hearing aids[24].

[21] Nach Informationen von Otto Bock: www.ottobock.de ;Universitätsklinikum Heidelberg/Klinik für Orthopädie und Unfallchirurgie: https://www.klinikum.uni-heidelberg.de/Myoelektrische-Prothese.110319.0.html ;Hoffmann KL, Dietl H: Handprothesen: Nach dem Vorbild der Natur. Dtsch Arztebl 2010

[22] Statistiken | Deutscher Schwerhörigenbund e.V. (DSB) (schwerhoerigen-netz.https://www.schwerhoerigen-netz.de/statistiken/?L=0de) [21.06.2024]

23 Facts about hearing loss and deafness - British Academy of Audiology |British Academy of Audiology (baaudiology.org)

[24] Dispositivi acustici, cresce del 5% la popolazione che li utilizza. Confindustria Dispositivi Medici. 2022 (https://www.confindustriadm.it/comunicati-stampa/dispositivi-acustici-cresce-del-5-la-popolazione-che-li-utilizza-anche-per-la-pandemia/#:~:text=Confindustria%20Dispositivi%20Medici-

According to another dataset updated to 2019, 17.6% of the Italian population older than 15 years of age suffers from a moderate hearing loss, while 3.7% of the same reference group suffers from severe hearing loss[25].

The decontamination of hearing aids is crucial in maintaining their functionality and ensuring the health and well-being of the users, especially in the context of emergency situations where decontamination processes are critical. Moreover, without their hearing aids, individuals with hearing impairments may be unable to hear the orders or guidance of first responders, which could compromise their safety and the effectiveness of emergency response efforts. There are various types of hearing aids designed to accommodate different levels of hearing loss and user preferences. Behind-the-ear (BTE) hearing aids are suitable for those with up to 80-95% hearing loss and are known for their versatility and effectiveness. In-ear (ITE) hearing aids, on the other hand, are designed for individuals with up to 60% hearing loss and offer a more discreet option[26]. Hearing glasses, which integrate hearing aids into the frame of eyeglasses, provide a convenient solution for those who need both visual and auditory assistance. Hearing jewellery, such as earrings with embedded hearing aids, offers an aesthetically pleasing alternative for users. Additionally, hearing implants, which are surgically placed, provide a more permanent solution for severe hearing loss.

Maintaining and decontaminating hearing aids properly is vital to ensure their longevity and optimal performance. Users should always remove their hearing aids before showering, bathing or washing their hair to prevent water damage. It is also important to avoid applying makeup or cream near the hearing aid, as these substances can clog the device. Similarly, blow-drying the hearing aid should be avoided due to the risk of heat damage.[27]

For cleaning BTE hearing aids, users should wipe the housing with a cloth or gently rub it with a toothbrush to remove any debris. The plastic parts can be bathed in an alkaline solution made from a cleaning tablet to ensure thorough decontamination. ITE hearing aids require more delicate cleaning methods; users should employ special cloths, cleaning agents or brushes specifically designed for these devices and avoid using water, which can damage the internal components.

The materials used in hearing aids are selected for their durability and biocompatibility. These include acryl, photopolymers, “thermitec”, polyurethane, silicon and titanium for earmolds, while PVC is commonly used for sound tubes. These materials are designed to withstand daily wear and tear while providing a comfortable fit for the user[28].

,Dispositivi%20acustici%2C%20cresce%20del%205%25%20la%20popolazione%20che%20li,utilizza%20(anche%20per%20la%20pandemia)&text=Rimini%2C%204%20novembre%202022%20%E2%80%93%20Sebbene,4%25%20utilizza%20un%20apparecchio%20acustico.)

[25] Italian National Institute of Statistics, “Salute e ricorso a servizi sanitari, Italia e Ue - Anno 2019” https://www.istat.it/tavole-di-dati/condizioni-di-salute-e-ricorso-ai-servizi-sanitari-in-italia-e-nellunione-europea-indagine-ehis-2019/ (Accessed July 2024).

[26] Hörgeräte Arten Übersicht: Welche Hörgeräte gibt es? (mobihttps://www.mobil-bleiben.de/hilfsmittel/hoergeraete/hoergeraete-uebersicht/l-bleiben.de) [21.06.2024]

[27] Hörgeräte Arten Übersichthttps://www.mobil-bleiben.de/hilfsmittel/hoergeraete/hoergeraete-uebersicht/t: Welche Hörgeräte gibt es? (mobil-bleiben.de) [21.06.2024]

[28] Hörgeräte Arten Übersicht: Welche Hörgeräte gibt https://www.mobil-bleiben.de/hilfsmittel/hoergeraete/hoergeraete-uebersicht/es? (mobil-bleiben.de) [21.06.2024]

In the context of decontaminating supportive devices for people with disabilities, hearing aids require careful attention. Proper decontamination not only maintains the functionality of the hearing aids, but also protects users from potential infections and health complications. By following recommended cleaning procedures and using appropriate cleaning agents, the emergency responders or the fire fighters can ensure the hearing aids remain in good working condition, thereby maintaining the independence and quality of life of the contaminated citizens.

In conclusion, hearing aids are indispensable for the millions of people with hearing disabilities. Ensuring their cleanliness through proper decontamination practices, whilst extremely challenging for emergency responders, is essential for the health and well-being of users. This is particularly important in emergency situations where exposure to contaminants may be higher. By adhering to cleaning guidelines and understanding the materials and types of hearing aids, users can effectively maintain their devices and continue to benefit from their enhanced auditory capabilities.

Glasses

In Germany, glasses are a vital supportive device for a significant portion of the population. According to statistics from 2019, 41.1 million people aged 16 or older wear glasses, with 23.4 million of them wearing glasses permanently and 17.7 million using them casually[29]. A UK report in 2013 found that 69 percent (around 44 million) of people in the UK either wear corrective eyewear, or have had laser eye surgery to help them see better[30]. When it comes to Italy, 16.7% of the overall population suffers from for moderate limitations in vision. Overall 18.6 percent of the population suffers from some forms of visual impairments, a percentage that rises to 33.8 percent among those over 65 and 41.9 percent among those over 75[31]. In Italy, around 4 out of 10 people use corrective eyeglasses and/or contact lenses. 10.7% of children up to the age of 14 use prescription glasses; the value grows to 26.4% for people aged 15-19, 30% between 40 and 44 years, 50% from 44 and 49 years, and 67.6% from 75 to 79 years[32].

Visual aids are essential for ensuring that individuals can perform daily tasks effectively and safely, making their maintenance and decontamination especially important in emergency situations.

Glasses are composed of several components, each requiring specific attention during cleaning and decontamination. These components include lenses, nose pads, rims, bridge, hinges, temples and temple tips. The materials used in the construction of glasses can be broadly categorized into natural materials, plastics and metals. Natural materials such as wood, horn, leather, fabric and paper offer unique aesthetic qualities, but require special care. For instance,

[29] Brillenstudie | ZVA https://www.zva.de/brillenstudie [21.06.2024]

30 beh_report_final_(1).pdf (wcb-ccd.org.uk)

[31] Italian Ministry of Health, "La disabilità visiva in Italia", https://www.salute.gov.it/portale/prevenzioneIpovisioneCecita/dettaglioContenutiPrevenzioneIpovisioneCecita.jsp?lingua=italiano&id=2389&area=prevenzioneIpovisione&menu=vuoto (Accessed July 2024).

[32] Social Security and Walfare. ISTAT (Accessed July 2024).

horn does not tolerate moisture or high temperatures and acetate, a type of plastic, can deform under high temperatures.[33]

Plastics used in glasses include acetate, polyamide and optyl (an epoxy resin). These materials are popular due to their versatility and durability. Metals such as titanium, stainless steel, nickel silver alloy and monel-alloy are also commonly used, providing strength and a sleek appearance. Each material has specific properties that influence how the glasses should be cleaned and maintained, especially under the stress of emergency decontamination.[34]

Lenses, the most crucial part of glasses, can be made from mineral or plastic materials. Plastic lenses can be further divided into duroplastics and thermoplastics. These lenses need careful handling to avoid scratches and maintain optical clarity. For plastic lenses, it is advised to clean them under lukewarm running water. Cleaning agents should not contain anionic surfactants and solvents, as these can damage the lens surface. While microfiber cloths are often used, they are not ideal for cleaning lenses. Instead, soft, lint-free cloths are recommended. It is important to avoid extreme temperatures and abrasive materials like paper towels or rough textiles, which can scratch the lenses. Household cleaners and washing-up liquids should be avoided as they can dissolve the protective coatings on the lenses. Exposure to temperatures above 65°C can cause cracks in the anti-reflective coating and temperatures above 50°C can lead to other forms of damage, permanently impairing visual comfort.[35]

In emergency situations where decontamination is necessary, these considerations become even more critical. Ensuring that glasses are properly cleaned without damaging them is essential for wearers being able to continue relying on their vision aids without interruption. Emergency responders must be aware of the different materials and appropriate cleaning methods to prevent inadvertently damaging these essential devices.

In conclusion, glasses are indispensable for millions of people in Germany, enhancing their quality of life and enabling them to perform everyday tasks. Proper decontamination and cleaning, especially in emergency situations, are crucial to maintaining the functionality and longevity of these devices. By understanding the materials and appropriate care methods, users and emergency responders can ensure that glasses remain effective and reliable aids for those who depend on them.

[33] Brillenfassung -Acetat, Titan..eine Materialübersicht | OPTIK-AKADEMIE https://www.optik-akademie.com/deu/info-portal/augenoptik/brille/fassungen/allgemein/materialien.html [21.06.2024]

[34] Pflegehinweise für Kunststoffgläser - Brillen, Lesebrillen, Kontaktlinsen hier bei ihrem Internetoptiker. (1a-sehen.de) https://www.1a-sehen.de/Pflegehinweise-fuer-Kunststoffglaeser:_:33.html [21.06.2024]

[35] Pflegehinweise für Kunststoffgläser - Brillen, Lesebrillen, Kontaktlinsen hier bei ihrem Internetoptiker. (1a-sehen.de) https://www.1a-sehen.de/Pflegehinweise-fuer-Kunststoffglaeser:_:33.html [21.06.2024]